

What is claimed is:

1. A process for forming a printed circuit board composite comprising:

a) etching at least one surface of a polymeric substrate;

5 b) coating a first polymeric film onto a surface of a metal foil; and

c) laminating the first polymeric film onto the substrate by:

i.) laminating the first polymeric film directly onto at least one etched surface of the substrate, or

10 ii.) laminating the first polymeric film onto at least one etched surface of the substrate via an intermediate second polymeric film.

2. The process of claim 1 wherein the first polymeric film is laminated directly onto at least one etched surface of the substrate.

15 3. The process of claim 1 wherein the first polymeric film is laminated onto at least one etched surface of the substrate via an intermediate second polymeric film.

20 4. The process of claim 1 wherein the polymeric film and the polymeric substrate comprise the same polymer.

5. The process of claim 1 wherein the substrate comprises a polyester.

6. The process of claim 1 wherein the substrate comprises a polyimide.

25

7. The process of claim 1 wherein the first polymeric film comprises a polyester.

8. The process of claim 1 wherein the first polymeric film comprises a polyimide.
9. The process of claim 1 wherein the metal foil comprises a material selected from the group consisting of copper, zinc, brass, chrome, nickel, aluminum,  
5 stainless steel, iron, gold, silver, titanium and combinations and alloys thereof.
10. The process of claim 1 wherein the metal foil comprises copper.
11. The process of claim 1 wherein the first polymeric film has a thickness of  
10 about 3  $\mu\text{m}$  to about 50  $\mu\text{m}$ .
12. The process of claim 1 wherein the metal foil has a thickness of about 3  $\mu\text{m}$  to about 200  $\mu\text{m}$ .
13. The process of claim 1 wherein etching step (a) is conducted with an aqueous alkaline solution.
14. The process of claim 1 wherein etching step (a) is conducted with an aqueous solution comprising a Group I or Group II hydroxide.  
20
15. The process of claim 1 wherein etching step (a) is conducted with an aqueous alkaline solution comprising NaOH or KOH.
16. The process of claim 1 wherein etching step (a) is conducted with a plasma  
25 etchant.

17. The process of claim 1 wherein etching step (a) is conducted with a plasma etchant comprising a mixture of oxygen (O<sub>2</sub>) and tetrafluoromethane.
18. The process of claim 17 wherein the plasma etchant comprises at least about  
5 3% of tetrafluoromethane.
19. The process of claim 17 wherein the plasma etchant comprises greater than about 7% of tetrafluoromethane.
- 10 20. The process of claim 1 wherein etching step (a) is conducted such that at least about 0.45 μm of the substrate surface is removed.
21. The process of claim 1 wherein laminating is conducted by autoclave lamination; vacuum hydraulic pressing; non-vacuum hydraulic pressing; hot roll  
15 lamination; or by heating the metal foil by an amount sufficient to soften the polymeric film by flowing an electric current through the foil and attaching the polymeric film to the substrate.
22. The process of claim 1 wherein first and second surfaces of the substrate are  
20 etched.
23. The process of claim 22 further comprising:
- i.) laminating an additional first polymeric film coated on a surface of an additional metal foil directly onto the second etched surface of the  
25 substrate, or

ii.) laminating an additional first polymeric film coated on a surface of an additional metal foil onto the second etched surface of the substrate via an intermediate second polymeric film.

5    24. The process of claim 23 wherein the additional first polymeric film is laminated directly onto the second etched surface of the substrate.

25. The process of claim 23 wherein the additional first polymeric film is laminated onto the second etched surface of the substrate via an intermediate  
10    second polymeric film.

26. The process of claim 23 wherein laminating is conducted by autoclave lamination; vacuum hydraulic pressing; non-vacuum hydraulic pressing; hot roll lamination; or by heating the metal foil by an amount sufficient to soften the  
15    polymeric film by flowing an electric current through the foil and attaching the polymeric film to the substrate.

27. A printed circuit board composite comprising a polymeric substrate having a first etched surface, a first polymeric film attached to the first etched surface of  
20    the substrate and a layer of a metal foil attached to an opposite side of the first polymeric film.

28. The printed circuit board composite of claim 27 wherein the substrate further comprises a second etched surface opposite the first etched surface, an additional  
25    first polymeric film attached to the second etched surface and an additional layer of a metal foil attached to an opposite side of the additional first polymeric film.

29. The printed circuit board composite of claim 27 wherein the substrate comprises a polyimide.

30. The printed circuit board composite of claim 27 wherein the first polymeric  
5 film comprises a polyimide.

31. The printed circuit board composite of claim 27 wherein the metal foil  
comprises a material selected from the group consisting of copper, zinc, brass,  
chrome, nickel, aluminum, stainless steel, iron, gold, silver, titanium and  
10 combinations and alloys thereof.

32. The printed circuit board composite of claim 27 wherein the metal foil  
comprises copper.

33. The printed circuit board composite of claim 27 wherein the first polymeric  
15 film has a thickness of from about 3  $\mu\text{m}$  to about 50  $\mu\text{m}$ .

34. The printed circuit board composite of claim 27 wherein the metal foil has a  
thickness of from about 3  $\mu\text{m}$  to about 200  $\mu\text{m}$ .

20

35. A process for forming a printed circuit board comprising:

- a) etching at least one surface of a polymeric substrate;
- b) coating a first polymeric film onto a surface of a metal foil;
- c) laminating the first polymeric film onto the substrate by:  
25 i.) laminating the first polymeric film directly onto at least one etched  
surface of the substrate, or

- ii.) laminating the first polymeric film onto at least one etched surface of the substrate via an intermediate second polymeric film;
- d) depositing a photoresist onto the metal foil;
- e) imagewise exposing and developing the photoresist, thereby revealing
- 5 underlying portions of the metal foil; and
- f) removing the revealed underlying portions of the metal foil.

10 36. The process of claim 35 further comprising roughening the surface of the metal foil opposite the polymeric film prior to step (d).

37. The process of claim 36 wherein the roughened surface of the metal foil has an average roughness value that ranges from about 1 to about 10 microns.

15 38. The process of claim 36 wherein the roughened surface of the metal foil comprises micro-nodules of a metal or metal alloy on or in the roughened surface.

39. The process of claim 36 wherein the roughened surface of the metal foil is roughened by micro-etching.

20 40. The process of claim 35 further comprising the step of removing any remaining photoresist after step (f).

41. The process of claim 35 wherein the revealed portions of the metal foil are removed by acid etching.

25 42. The process of claim 35 wherein the revealed portions of the metal foil are removed by alkaline etching to the substrate.